CHAPTER 5

Anomaly Avoidance Procedures During HTRW Investigation/Design Activities

5-1. Introduction.

a. This chapter discusses anomaly avoidance procedures during the investigative/design phase of any project on a site with known or suspected MEC. USACE implements anomaly avoidance procedures primarily on HTRW sites where there is the potential to encounter MEC. HTRW-related activities during the investigative/design phase which have the potential for encountering MEC include, but are not limited to, surveying and mapping, environmental and natural resource assessments, surface and subsurface sampling, boring and drilling, and groundwater monitoring.

b. The purpose of anomaly avoidance during HTRW-related activities is to avoid any potential surface MEC and subsurface anomalies during sampling activities. Intrusive anomaly investigation is not authorized during anomaly avoidance operations. Procedures for dealing with explosives-contaminated soils are addressed in paragraph 1-1d of this pamphlet.

5-2. UXO Team Composition. For anomaly avoidance on an HTRW site with known or suspected MEC, the contractor shall provide a UXO team consisting of a minimum of two personnel, one of whom must be a UXO Technician II. This individual will be the UXO team leader. The UXO team must be on-site during all sampling activities. The UXO team may include additional UXO-qualified personnel, geophysicists, or any other team member, depending on site- and task-specific conditions/requirements. Contact the MM CX for a description of the current qualifications for contractor UXO personnel.

5-3. Planning. The MEC contractor shall prepare a Work Plan to supplement the HTRW contractor's or USACE's Work Plan/Site Plan, as described in Chapter 3.

5-4. Responsibilities. The UXO team members have the following responsibilities for anomaly avoidance procedures during an HTRW investigation project on a site with known or suspected MEC:

a. Provide the MEC recognition, location, and safety functions for the HTRW contractor during HTRW sampling activities.

b. Conduct MEC safety briefings for all site personnel and visitors.

c. Obtain utility clearance and/or excavation permits for underground utilities, if required, before the UXO team begins any incremental subsurface geophysical survey activities. The UXO team is responsible for verifying that all necessary excavation permits are on-site prior to commencing operations. The prime contractor is responsible for contacting the appropriate agency(ies) or company(ies) to mark the location of all subsurface utilities in the construction area. All located utilities will be marked by paint, pin flags, or other appropriate means to visually delineate their approximate subsurface routing. The color used for marking will not conflict with the colors used in MEC operations. If subsurface utilities are suspected to be present in an excavation area, the UXO team must attempt to verify their location.

5-5. Authority. The senior UXO-qualified person has final on-site authority on MEC procedures and safety issues.

5-6. Access Surveys. The UXO team must conduct a surface access survey and a subsurface survey for anomalies before any type of activities commence, including foot and vehicular traffic.

a. HTRW sampling personnel must be escorted by UXO-qualified personnel at all times in areas potentially containing MEC until the UXO team has completed the access surveys and the cleared areas have been marked. Escorted HTRW personnel will follow behind the UXO escort. If anomalies or MEC are detected, the UXO escort will halt escorted personnel in place, select a course around the item, and instruct escorted personnel to follow.

b. The UXO team will conduct an access survey of the footpath and/or vehicular lanes approaching and leaving HTRW sampling areas with known or suspected MEC. Typically, the access route will be at least twice as wide as the widest vehicle that will use the route.

c. The UXO team must also complete an access survey of an area around the proposed investigation site that is large enough to support all planned operations. The size of the surveyed area will be site-specific and will take into account, for example, maneuverability of required equipment (e.g., drill rigs, excavation equipment, etc.), parking of support vehicles, and establishment of decontamination stations. As a minimum, the surveyed area will have a dimension in all directions equal to twice the length of the longest vehicle or piece of equipment to be brought on-site.

d. Geophysical instrumentation capable of detecting the smallest known or anticipated military munition will be used to locate anomalies just below the surface that may be

encountered through erosion from rain or continual vehicular traffic. The various types of geophysical detection instruments are discussed in Chapter 4.

e. If anomalies or surface MEC are encountered, they will be marked with flagging and the investigation area will be relocated to avoid contact. The UXO team will clearly mark the boundaries of the surveyed area using survey flagging and pin flags. The UXO team will establish a system of flagging colors that will distinguish anomalies, surface MEC, and route boundaries from each other as well as from any utility markings that have been used at the site.

f. If surface MEC is encountered, the UXO team will assess the condition of the MEC to determine if a disposal action is required. MEC disposition will follow the procedures discussed in paragraph 5-13.

g. No personnel will be allowed outside the surveyed areas.

5-7. Surface Soil Sampling. Surface soil samples are normally collected at depths from zero to 6 inches below ground surface. The following paragraphs describe anomaly avoidance procedures for soil sampling between zero and 6 inches below ground surface on an HTRW site with known or suspected MEC. Soil sampling at depths greater than 6 inches below ground surface on an HTRW site with known or suspected MEC will follow the procedures discussed in paragraph 5-10.

a. The UXO team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site, as described in paragraph 5-6.

b. The UXO team must visually survey the surface of each proposed surface soil sampling site for any indication of MEC or MC impact. In addition, the UXO team must conduct a survey of the proposed sampling locations using geophysical instruments capable of detecting the smallest known or anticipated military munition to a depth of 1 foot. The various types of geophysical detection instruments are discussed in Chapter 4.

c. If anomalies are detected at a proposed sampling location or too many anomalies are detected in a general area of interest, the HTRW personnel will select an alternate location for collection of surface soil samples. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance during HTRW sampling activities.

5-8. Passive Soil Gas Sampling. Passive soil gas sampling typically involves excavation of holes (1-inch to 1½-inches in diameter) to a depth of less than 5 feet and the installation and subsequent removal of sampling devices (typically 24-inch-long by ½-inch-inside-diameter tubes). The following paragraphs describe anomaly avoidance procedures for passive soil gas sampling on an HTRW site with known or suspected MEC.

a. The UXO team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site, as described in paragraph 5-6.

b. The UXO team must visually survey the surface of the proposed passive soil gas sampling sites for any indication of MEC or MC impact. In addition, the UXO team must conduct a survey of the proposed sampling locations using geophysical instruments capable of detecting the smallest known or anticipated military munition to the specified emplacement depth for the sampling canister.

c. Utilities will be cleared and dig permits will be obtained in accordance with the procedures outlined in paragraph 5-4c.

d. If the emplacement depth is greater than the geophysical instrument's detection capabilities, then the UXO team must incrementally complete the geophysical survey every 12 inches while excavating for emplacement of the sampling canisters. While the UXO team is completing their geophysical survey remaining project personnel must withdraw out of the immediate area.

e. If anomalies are detected at a proposed sampling location or too many anomalies are detected in a general area of interest, the HTRW personnel will select an alternate location for collection of passive soil gas samples. If an anomaly is detected during an incremental geophysical survey, the hole will be backfilled in accordance with site-specific procedures. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance.

f. Unless a path is clearly marked, the HTRW sampling personnel must be escorted by a UXO-qualified person when they subsequently return to each soil gas sampling site to retrieve the sampling canisters.

5-9. Active Soil Gas Sampling and Direct Push Technology (DPT). Active soil gas sampling typically involves manual or mechanical penetration at the desired location followed by withdrawal and collection of a soil gas sample. DPT is a common method for mechanical

penetration during active soil gas sampling. The following paragraphs describe anomaly avoidance procedures for active soil gas sampling and use of DPT on an HTRW site with known or suspected MEC.

a. The UXO team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site, as described in paragraph 5-6.

b. Active soil gas sampling and DPT installations will follow the same anomaly avoidance procedures outlined below for soil boring and monitoring well installations. The actual sampling will occur through the pilot hole or a boring located within a 2-foot radius of the pilot hole installed by the UXO team. If the pilot hole cannot be used to obtain a representative soil gas sample, it must be backfilled in accordance with site-specific procedures prior to the installation and sampling of the soil gas sampling point. The backfilling of the pilot hole will be performed to prevent the soil gas sampling from being diluted by atmospheric air that may be drawn in through the pilot hole. Following collection of the soil gas sample, the sampling location must be backfilled in accordance with site-specific procedures.

5-10. Subsurface Soil Sampling and Monitoring Well Installation. Subsurface soil sampling is defined as the collection of samples below a nominal depth of approximately 6 inches by means of a split-spoon, Shelby tube, or bucket auger soil sampler using drilling techniques. Drilling techniques are also used to install groundwater monitoring wells for HTRW investigative sampling. The following paragraphs describe anomaly avoidance procedures for subsurface soil sampling and monitoring well installations on an HTRW site with known or suspected MEC.

a. The UXO team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site, as described in paragraph 5-6.

b. Utilities will be cleared and dig permits will be obtained in accordance with the procedure outlined in paragraph 5-4c.

c. The UXO team must complete a subsurface geophysical survey of the proposed drill hole location(s). If an anomaly is detected, HTRW sampling personnel must select a new drill hole location. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance. If the subsurface sampling or well installation depth is greater than

the geophysical instrument's detection capabilities, the UXO team must incrementally complete the geophysical survey as outlined below.

(1) Pilot Hole/Incremental Geophysical Survey. Once an access survey has been completed, the UXO team will install a pilot hole at each proposed drill hole location. While the UXO team is completing their geophysical survey remaining project personnel must withdraw out of the immediate area.

(a) If an anomaly is detected, the pilot hole will be backfilled in accordance with site-specific procedures and HTRW sampling personnel must select a new drill hole location. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance.

(b) As long as no anomalies are detected, the pilot hole will be advanced to the maximum reach of the auger or to the maximum depth of the proposed drill hole, whichever is less. During the excavation of the pilot hole the drill rig's auger will be withdrawn and the hole checked for anomalies every 12 inches. The pilot hole will also be inspected upon reaching the final depth, providing a total clearance depth equal to the pilot hole depth plus 12 inches. If no anomalies are detected to the total depth of the proposed drill hole, the drill rig may be brought on-site and utilized.

(c) In cases where the pilot hole does not reach the full depth of the proposed boring (e.g., the proposed depth of the drill hole is more than the maximum depth of the auger, or the UXO team cannot penetrate the soils using the auger), the drill rig may be brought on-site and advanced in 12-inch increments beyond the clearance depth of the pilot hole. At the end of each 12-inch increment, the drill rig's auger must be withdrawn from the hole so that the UXO team may screen for anomalies as described above. As necessary with loose soils, a polyvinyl chloride (PVC) pipe (minimum 3 inches inner diameter) will be inserted to keep the hole open and to allow for incremental geophysical screening.

(d) When working in impact areas, the UXO team may discontinue incremental screening once the drilling has extended to depths of 30 feet below ground surface, the depth of penetration of the MEC has been exceeded, or the planned depth of drilling has been reached, whichever is less.

(e) For all other areas, incremental screening will be determined based on an assessment of the site's characteristics and history.

(2) Monitoring of Drilling by Others. Once the UXO team determines that a proposed drill hole location is free of anomalies, using the procedures described above, the drilling contractor shall be notified that the site is available for subsurface sampling or monitoring well installation.

(a) The drilling contractor's actual drill hole must be located within a 2-foot radius of the pilot hole installed by the UXO team. While this proximity to the pilot hole may affect the accuracy of "blow counts" for the HTRW team, anomaly avoidance takes precedence.

(b) Any drilling beyond the clearance depth of the pilot hole will be conducted in 12-inch increments to allow the UXO team to screen for anomalies. In order to avoid magnetic interference from the augers, the drill rig must withdraw its augers from the hole for the geophysical survey. As necessary with loose soils, a PVC pipe (minimum 3 inches inner diameter) may be inserted to keep the hole open and to allow for incremental geophysical screening. Drilling equipment and/or metallic support materials (e.g., drill rig, augers, drill rods, casings, etc.) may create an interference affecting the operation of the geophysical survey instrument during the incremental inspection process. In such an event, the item(s) creating the interference must be relocated outside the interference range of the geophysical instrument during each incremental inspection of the drill hole. If an anomaly is detected, the drill hole will be backfilled in accordance with site-specific procedures and HTRW sampling personnel must select a new drill hole location.

(c) When working in impact areas, the UXO team may discontinue incremental screening once the drilling has extended to a depth of 30 feet below ground surface, the depth of penetration of the MEC has been exceeded, or the planned depth of drilling has been reached, whichever is less.

(d) For all other areas, incremental screening will be determined based on an assessment of the site's characteristics and history.

5-11. Test Pit and Trench Excavations. Test pits and trench excavations are used to identify and characterize large subsurface HTRW areas of concern. The following paragraphs describe anomaly avoidance procedures for test pit and trench excavations on an HTRW site with known or suspected MEC.

a. The UXO team must conduct an access survey of the routes to and from the proposed investigation site as well as an area around the investigation site as described in paragraph 5-6.

b. The UXO team must complete a subsurface geophysical survey of the proposed excavation locations. If an anomaly is detected, HTRW sampling personnel must select a new excavation location. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance. If the proposed excavation depth is greater than the geophysical instrument's detection capabilities, the UXO team must incrementally complete the geophysical survey as outlined below.

(1) Underground Utilities. The procedures outlined in paragraph 5-4c will be followed.

(2) Excavation Procedures. Once an access survey has been completed, HTRW personnel may begin excavation in 1-foot increments. While the UXO team is completing their geophysical survey remaining project personnel must withdraw out of the immediate area.

(a) At the end of each 1-foot increment, the UXO team will screen for anomalies. If an anomaly is detected, HTRW sampling personnel must modify the excavation location to avoid the anomaly. Any anomalies detected will be prominently marked with survey flagging or pin flags for avoidance.

(b) If MEC is uncovered in an excavation, all operations will cease. The UXO team will assess the condition of the MEC to determine if disposal action is required. MEC disposition will follow the procedures discussed in paragraph 5-13. Once MEC has been encountered in an excavation, no further excavation is allowed at that location until EOD has removed the MEC. Once the MEC is removed, excavation using anomaly avoidance techniques may continue. If munitions with unknown fillers are discovered refer to the procedures identified in Chapter 7. The After Action Report will indicate that MEC was encountered and summarize the resulting activities.

c. Waste and/or Other Materials Encountered. In the event that potentially hazardous waste, debris, or drums are encountered during test pit or trenching operations, excavation activities will cease. The HTRW Site Safety and Health Officer (SSHO) will assess the situation and may direct a change to the PPE for site workers. The SSHO will notify the appropriate personnel in accordance with the site-specific Work Plan. Wastes will be handled in accordance with the site-specific IDW Management Plan.

5-12. Groundwater Monitoring/Aquifer Characterization. Groundwater monitoring activities include measurement of groundwater elevations, measurement of free product thickness, and collection of analytical samples. Groundwater monitoring wells may also be used for aquifer

characterization activities (e.g., slug tests). Unless a path is clearly marked, the HTRW sampling personnel must be escorted by UXO-qualified personnel, as described in paragraph 5-6a, when they subsequently return to conduct groundwater monitoring/aquifer characterization activities.

5-13. MEC Disposition. Since the purpose of MEC support during HTRW activities is anomaly avoidance, the UXO team is not tasked to perform MEC disposition. MEC disposition will not be covered in the planning documents for the project, and, therefore, the UXO team is not capable of or equipped to perform MEC disposition. In the event that MEC is encountered that cannot be avoided or, based on its fuzing or current condition, presents an imminent hazard requiring immediate attention, the UXO team will notify the local POC designated in the Work Plan. The UXO team will not destroy any of the MEC encountered. The local POC will notify the appropriate authority of the MEC discovery and the UXO team will safeguard the site pending arrival of the appropriate authority.

a. On active installations, MEC disposition requests will normally require reporting to the Range Control Officer, Facility Engineer, Post Headquarters, or POC designated in the Work Plan.

b. On FUDS, the local POC will facilitate the EOD response. If the local POC designated in the Work Plan is not the local law enforcement agency, the local POC will inform the local law enforcement agency of the discovery. The local POC will also contact the MM CX.

5-14. Quality Management. HTRW Design Districts will include anomaly avoidance capability in all applicable indefinite delivery order contracts for HTRW reports, designs, or remedial actions on FUDS or active military sites. MEC concerns must be addressed before initiating any HTRW field investigation activities. Prior to initiation of on-site activities, items developed for MEC support of HTRW activities (i.e., SOW and Work Plan) must be submitted to the appropriate MM DC and the MM CX for review in accordance with the roles and responsibilities set forth in Chapter 1. The executing district is responsible for supervising the fieldwork and ensuring compliance with all approved plans by all USACE and contractor personnel. The MM CX may also conduct random inspections to verify conformance. A separate on-site, full-time UXO Quality Control Specialist (UXOQCS) is not required for MEC avoidance activities. However, the MEC support contractor shall perform QC reviews of its MEC-related field activities. Upon completion of the MEC support activities, the PM will ensure that an After Action Report is submitted to the MM CX.